

# **The Technology Corner**

**A monthly column of technology rambling, rumination and reality**

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## **Rooted In Technology Part 2 - April 2009**

Part 1 of this series covered the founding of [TC]² and its technology focus on equipment development. Much of the early work on equipment took place before [TC]² had a place of business or a full-time staff. In 1987 when the decision was made to open a technology center and bring in full-time staff, training was a part of the [TC]² core. The first full-time Managing Director, Joe Off had founded a company called Train-A-Mation. The Assistant Director, Frank Hughes had pioneered self-paced training while at Cluett Peabody. Frank's passion was video production on laser disc, with built-in testing and automated manager reporting on student progress. The laser disc player provided a technology foundation that served for many years, eventually becoming obsolete due to compact disc and later DVD. I-Pods had not yet been invented, or I'm sure training would have been found on the I-Pod platform.

Over the years from 1989 through 2000, a video training and production department was a part of [TC]². MTB, the media technology branch of [TC]², employed about fifteen videographers, editors, content specialists and technicians engaged in the production of content and packaging for projects as diverse as spinning frames and carding machines to consumer CDs teaching how to knit and crochet, sponsored by Coats & Clark and sold at Wal-Mart. This business was renamed MindWorks Multimedia, and was spun out to independent ownership and today continues to produce high quality video.

With the opening of [TC]²'s National Apparel Technology Center in Raleigh, the demonstration of new manufacturing technologies became a reality. Equipment vendors were persuaded to place machines and other technology on consignment to provide a visual demonstration of real manufacturing, but in a setting that inspired innovative ideas and wowed first-time visitors. With CAD systems from the two domestic vendors, CNC cutting, unit production system and a number of sewing machines with automated features and attachments, the center produced men's trousers for multiple retailers, using domestically produced fabrics with textile mills, retailers and [TC]² linked by EDI, the demonstration center bustled with visitors and tour groups on a daily basis. A Novell NetWare local area network with computers running DOS and Windows 3.0 eventually gave way to Windows 3.1. We were truly modern! The World Wide Web would come four years later.

Before joining [TC]² as the Director of R&D, I held a similar position with Haggar Apparel Company. During 1989-1990, I made trips to Japan, learning about a flexible sewing system pioneered by Toyota. I was fascinated with its potential, and spent much time developing a strategy to bring the technology to Haggar. My future colleagues were also traveling Japan, seeing many of the same factories and meeting with the same people as they gathered information to bring back to the U.S. We were unknown to each other at the time, so despite paths almost crossing, it was not until I came to [TC]² that I learned that they had also been working with Toyota to bring the technology to [TC]². Toyota was unable to place a system in the demonstration center, so a version was developed that demonstrated the benefits to be gained, spawning a series of seminars and short courses for apparel executives and managers who needed to learn more about this emerging technology. Hundreds of people were trained in the early 1990's. From this beginning, [TC]²'s consulting practice was born. More on this later.

As the educational offerings grew in number and scope, the intern program, which had begun in 1989 also grew. Rising seniors from universities and colleges with apparel curriculum were selected by an outside

committee to eliminate any taint of unfair selection. Professors who managed and taught in the universities were invited to a five week Faculty Fellows program, which overlapped with the ten week program for students. It was an exciting time, with students and faculty taking courses side by side, and doing research that led to a graduation that was both tearful and inspiring. The exposure to such a range of technology was unprecedented in a non-academic setting, and served well the more than one hundred students who participated over the years.

By chance, [TC]<sup>2</sup>'s Managing Director had attended an Apparel Research Committee conference in Atlanta, which I, too attended. The year was 1985. A presentation was made by Peter Kuhlmann which presented a vision of using a whole body scanner to make custom clothing. As we began developing a research agenda in 1991, the 1985 presentation came up. Scanning technology, which was to form the basis for this new concept was under development at New York Institute of Technology. Joe Off and Mike Fralix had been in contact with Peter Kuhlmann who had sponsored some of the research at NYIT. We made a trip to Long Island to view a primitive setup on the darkened stage of a semi-abandoned school auditorium. Thus begins the long and winding development trail that has spanned more than fifteen years.

As I pursued the development of robotics and sewing machine accessories as described earlier, the development of a research agenda that was both advanced in concept and technically challenging began to take shape. I coined the term "Apparel On Demand", which was our working title for three or four years. In order to achieve "Apparel On Demand" the development of a number of technologies would be required. First, body scanning had to be made to work, in order to have accurate sizing for making patterns. With accurate body size measurements, patterns would follow, although at the time there was no automatic pattern generation software. That too became a development project. How would we cut all these expected custom garments? The high ply cutters of the day were overkill. A single ply cutter would be needed. It would have to be smaller, less expensive, and have an interface to the automated pattern system to allow seamless scanning, pattern making, and cutting. Another research project was defined. Single ply cutting was then done with very expensive laser cutters built by Hughes Aircraft Corporation. As the concept for "Apparel On Demand" began to gel, a visit by the U.S. Department of Agriculture helped to further shape the direction that our research would take. With family farms being purchased by corporate interests at a fast rate, and with efficient farming methods being employed by corporate farms, we were able to enjoy falling food prices, but many farm workers who lacked industrial skills were becoming unemployed, and unemployable. Could we do something to make jobs available for these rural workers who had a work ethic that involved getting to work before dawn and doing hard work all day? The concept of hundreds of small apparel plants in scattered locations, being centrally controlled fit well with our ideas of "Apparel On Demand". Early sketches made by a commercial artist showed small buildings linked overland by telephone lines. Remember, there was no public internet in those days. ARPANET was in use by universities and government labs, but was not commercially viable for linking these small apparel plants.

A contract for purchase of two body scanners from Dimensional Measurement Systems seemed to solve the problem of scanners. We moved on to pattern generation. MicroDynamics of Dallas was a CAD vendor, and was the only response we had to a request for proposal. Another signed contract launched that development. It would be based on the emerging IBM OS2 operating system, the very latest in technology! Cutting was a different matter. We advertised for proposals and received several. Ranging from modified traditional cutters to gas flame cutting, (a definite fire hazard), to stacked machines to achieve throughput, none of the proposals had adequate potential for success. We were at square one with single ply cutting.

We learned of a three person startup company that had built a small laser cutter for cutting sails for boats from materials that were difficult to cut. The first machine was installed in a boatworks on Long Island. A visit brought us to Buddy Duncan and Jim Herman, founders of a company called The Cutting Edge. As we watched the laser cutter moving slowly across the sail fabric, it was obvious that this would not be the technology we needed. Much greater speed would be required to keep up with expected demand. We had

been experimenting with a small sharp edged cutting wheel at [TC]<sup>2</sup>. Mounted on bearings and in an aluminum housing that was attached to one of the left-over robots from earlier projects, we managed to cut fabric in a controlled manner, and felt that we had part of the answer to the cutting problem. Discussing with the founders of The Cutting Edge our concept for a sacrificial wheel cutting against a steel belt that would form the bed of the cutter, they became interested in developing a single ply wheel cutter. Renewable adhesive would hold the fabric to the belt. The prototype that we developed at [TC]<sup>2</sup> is still in my office today. It spawned a new breed of cutter, and is one of the achievements that can be pointed to that [TC]<sup>2</sup> led to new companies and new cutters. A new contract for cutter development launched the research into single ply cutting.

Many changes were to occur as development progressed on the new cutter. First, no belt could be made wide enough for apparel fabrics, and the makers of the belt, Sandvik Steel in Sweden, could not guarantee that a welded belt could be made. A softer foam surface was substituted. Vacuum would be used to hold the fabric to the cutting surface. A porous foam would have to be found or developed. Tables would be fabricated with thousands of tiny holes through which air would flow, trapping the fabric. Servos replaced slower stepper motors to achieve the required performance. At every technical challenge new ideas were weighed and engineered to work as envisioned. The company went on to achieve success in producing single ply cutters for apparel, upholstery, and for leather cutting. Eventually Gerber Technologies acquired The Cutting Edge. Other makers emulated the machines.

During the time that work was progressing at The Cutting Edge, and at MicroDynamics, the scanner development at Dimensional Measurement Systems had fallen behind. It was the classic case of a developer attempting too much with too little. Payments that we had made to secure the initial research were expended on development of a foot scanner for a major bicycle maker in Japan. By the time that project was completed, the company lacked resources to complete the scanner project for which we had contracted. We also had changed the requirements during development, another common mistake known as “scope creep”. When it became impossible for research to continue at Dimensional Measurement Systems, we arranged to buy the laboratory equipment and hire two of the researchers to come to [TC]<sup>2</sup> for completion of the work. The scanner story must stop here, but will continue in a future column in The Technology Corner at TechExchange.com.

A 1994 book by Joe Pine popularized the term “Mass Customization”. His vision of offering a palette of limited choices served up to the consumer upon request met the description of our “Apparel On Demand”. As the book grew in popularity and the term became a part of the language of the day, we began to use it in favor of the term earlier coined.

We made an excursion into funding research into laser enhanced bonding. While laser was not selected for body scanning, it was used in a prototype to demonstrate the potential of creating a super strength adhesive bond in fabrics. The work was done in a small shop that had spun out of a technology incubator in Boulder Colorado. This technology was later licensed to Union Special and sold as “Light-Seam”. This will provide another story of development, intrigue, and with a cast of characters that could only be imagined by a soap opera writer.

Mentioned earlier is the consulting practice that is now an integral part of [TC]<sup>2</sup>. As the many managers and executives returned to their companies from seminars and courses taken at [TC]<sup>2</sup>, they would find the demands of their daily jobs would not allow the focus on implementation that would lead to savings in time, dollars or both. Requests came for help in the factories. At first, the leadership of [TC]<sup>2</sup> did not want to be in the consulting business. There were a number of qualified consultants serving the apparel industry, and we did not want to compete with them. We also felt that our role was to educate, not implement. As the chorus grew louder for help in the factories, a means was devised to allow entry into the world of assisting implementation of new technology. “Value-Added Coaching” would be the term used for the personnel from [TC]<sup>2</sup> who would go into the factories and help bring new systems and technologies on-line.

Computer simulation was becoming possible with the personal computer. Once relegated to mainframe or super mini-computers, software was being written to run on PC level machines, and [TC]<sup>2</sup> was quick to seize the new applications for use in simulating a factory environment. As the software gained power and speed, it was possible to run the entire production of a multi-line factory in only a few minutes. Using standard times and operator efficiencies from the target companies, the simulation was able to show with reasonable certainty what a certain setup would yield. It was now possible to make changes, re-run the simulations, and to fine-tune the production environment before actually making changes in the plant. This capability gave our engineers and consultants a viable tool upon which client management could see the potential, and also set expectations at levels which could be met. Our coaches had begun a transformation from coach to consultant to operations expert. Today that group employs modern techniques in mapping the before and after efficiency of client companies and does so with a high degree of certainty as to what will be accomplished at the completion of a project. Business process analysis can be applied in every area of a company's operations, from front office to product development, sales input, to product sourcing and distribution. Without a technology base, such work would be much more difficult, and the results less predictable.

The [TC]<sup>2</sup> scanner development team was assembled over the course of several years. Beginning with a mechanical engineer and a technical writer, the team grew to include computer scientists, programmers and an electrical engineer as well as the current VP of Technology Development who started in a mechanical engineering position. I count it as one of the great opportunities of my career to have been able to assemble a core group of bright people, allow them to self-manage the projects and to add members as they were needed. This team has brought the 3D Body Scanner to the level of international success that it has become.

While this article has focused on technology, its development and deployment, we have been supported over the years by a group of unsung contributors who keep the office systems working, employees and vendors paid, and administrative services humming. Having the flexibility to change when technology changes is in the fabric of each person here. Network topography, computer technology and applications as well as wireless communications have all driven this team to change and adapt.

While we invest our lives in driving technology, it is the vision of future technology that drives us. It's an exciting world. Stay tuned!

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